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CHEMISTRY AND MODERN LIFE

IT is my privilege to address you upon this important and auspicious occasion—the opening and dedication of the magnificent chemical laboratories created by the munificence of your generous and far-sighted donor, Mr. Jesse H. Metcalf. It is a gift which will have far-reaching consequences and which will exert influences that will continue to increase and broaden after we ourselves have gone.

Let me consider with you the purpose which these buildings will serve and the position which chemistry and science in general bid fair to attain in the life of mankind.

A chemical department flourishes most when side by side with strong departments of all faculties. It must be filled with the spirit of humanity, its teachers with the spirit of research. They should be a body of men whose zeal for knowledge and desire to increase it are principles of life; and its teaching should be such as to fit the student to be his own teacher and to continue the study of his subject on his own account after he has taken his degree.

Next to personnel comes the necessity for equipment. This is a factor which is seldom adequately taken into account and upon which it is impossible to lay too much stress. Lack of equipment means that work is stultified or crippled and that a building, however good, may become an empty shell; whereas with it the possibilities of the future are infinite.

Again it is perhaps not generally appreciated that a well-furnished library is as indispensable to workers in science as to those in any other faculty. Indeed, there are but few scientific theories whose significance and limitations can be fully understood without some idea of their historical development, which is only obtained by access to the original literature. This is frequently in a foreign language. Mere text-books appear dogmatic and infallible, and the more intelligent student rebels or may be repelled. It is when he turns to the original record that the subject becomes alive. Doubts are fairly met instead of being repressed, the exact implications and possible lines of extension are much more clearly seen.

May I remind you that chemistry has now become a vast subject far beyond the power of any one man, however gifted, to grasp. There are about 40,000

[1] Address delivered at the dedication of the Jesse Metcalf Chemical Laboratory, Brown University.

papers and contributions recorded in the chemical journals each year. Nevertheless, so infinite is nature that it is possible for any one with a general knowledge of the subject to possess himself, within a few months, of all the recorded knowledge on any selected topic. Again so extensive are the ramifications of chemistry and its applications that the number of workers of any scientific standing in any given subject, whether of scientific or industrial importance, is very limited. Truly, the laborers are few although the fields are white unto harvest.

The final requirement for a chemical department is that it should have some direct touch with industry. This brings more reality into academic laboratories which are too apt to be dominated by text-books and examinations, and it gives a better professional training. In the words of the report of the British Government's Privy Council for Scientific and Industrial Research:

> Pure science has in the past owed much to observations, suggestions and difficulties which have come from activities external to the laboratory or study. So will it be again, and it is our desire so to order the relations of workers in pure science to the industries going on around them that they may receive the stimulus of a wider outlook. In this way it may be possible in the end to create such an atmosphere that the new generation of students will cease to draw the distinction between "theory" and "practice," and technologists of all ranks will through them attain to the view that sound practice is only theory tempered by compromise.

This *liaison* "ensures the continued contact of the research worker with advanced students—an inestimable benefit in the opinion of all the best authorities. Finally, it enables us to use to the utmost advantage the very limited number of original workers available whether for research or for teaching."

The study of chemistry is but part of the work of a university, an institution which is one of the vital organs of a healthy community. A university has a duty towards and is owed a duty by society, both resting, as they do, upon the need for mutual sympathy and understanding.

This brings us to a consideration of the place that chemistry occupies in modren life. Chemistry is the science of the transformation of matter, lying at the basis of all human industry and of such applied sciences as agriculture and medicine. It is so enormously productive, both of new knowledge and of applications, that this aspect may overshadow its real scientific value. My own part of the subject, namely, physical chemistry, can be defined in two or three words—it is the study of the laws of chemistry. Chemistry during the greater part of its development has been the science of analyzing matter.

We realize that when we can take a thing apart we may be able to put it together again and put the parts together in a way superior, for our purpose, to the original arrangement. I need not labor this aspect of the subject, for I understand that you have heard an address by a very able exponent, Dr. Slosson, on "Creative chemistry." During the last fifty years the study of this science has produced numberless new products which had never appeared in nature before and which have proved of great value to mankind. I do not wish, however, to lend support to the false impression, which is only too current, that chemistry is a kind of black magic. On the contrary, the modern chemist tries to plan a reaction just as an engineer plans a bridge, with the same deliberate design and sustained purpose.

I wish to call your attention to an example taken from the ammonia industry which will illustrate the importance of the study of theory and of pure laboratory experiments. It is natural that I, coming from Bristol, should select this example of the fixation of nitrogen, for it was in Bristol that, in 1899, Sir William Crookes pointed out that the world's food supplies are dependent upon a supply of nitrogenous fertilizers to the soil.

Each crop takes so much out of the soil that unless this essential material is replaced the yield per acre steadily drops. There is an inexhaustible store of nitrogen in the air, but nitrogen as such is one of the most inert of materials. It is only when it has been made to combine with other elements, such, for example, as hydrogen, that it becomes available as plant food. The problem in this case consists in taking from the two abundant sources, air and water, the constituent nitrogen and hydrogen and combining them in the form of a new substance, ammonia.

At the beginning of the present century there was no known method for any such fixation of nitrogen, but as the result of applying pure research there are already many industrial methods of fixing nitrogen in actual operation on a very large scale. We shall now trace in outline the manner in which this great result has been achieved in the important instance I have mentioned, the synthesis of ammonia.

Thermodynamics supplies two of the most fundamental laws of science. The first law is that we can not get perpetual motion, we can not get work for nothing. The second law is that all spontaneous processes (and only these) may be utilized to give work. There is nothing more beautiful than watching the operation of these universal laws, quantitative in their application and as universal as the law of gravitation. They are examples of what Einstein calls "theories of principle," whose charm lies in their logical perfection.

On applying these laws to chemical reactions your famous Willard Gibbs, followed by van't Hoff and

thers, obtained a mathematical relationship called the Mass Law. This law revealed that it was within the power of the chemist to make the reaction $3H_2 + N_2 = 2NH_3$ go in whichever direction desired, for the effects of changes in such factors as pressure and temperature could be predicted. The first problem was to find the most suitable equilibrium.

Production of ammonia is increased by the application of 200 or even 1,000 atmospheres' pressure. The next problem to be solved was the regulation of the temperature to give the most satisfactory yield. The ammonia must be produced at a practical rate and to bring this about substances termed "catalyzers" are employed to hasten the reaction and in addition materials called promoters have been discovered which have the property of still further increasing the efficiency of the catalyzers. The explanation of the action of such catalyzers illustrates what Einstein terms theories of "construction," whose fascination lies in the simple but ingenious mechanism they reveal.

By applying all these principles the Germans have already succeeded in producing ammonia at the rate of over 1,000 tons a day. Thus, from the knowledge obtained by pure theoretical and laboratory research there has been achieved a result which is vital to the existence of the white population of the world and in this instance essential also for war. Further progress has been made in several countries, and commercial production has begun in England and the United States. Furthermore, concurrently with the development of the direct synthesis of ammonia, other alternative methods have been worked out on the largest scale for the fixation of nitrogen in various forms, and all within twenty years of Crookes' first challenge.

Time lacks for further specific illustration, but I wish to bring before you some more general considerations with regard to science. Pure science is study, and incessant effort to understand, testing every idea by the touchstone of truth. For its pursuit the chief requirement is character. This must be reinforced by enthusiasm and imagination. Constructive imagination must have the fullest play, and it is really surprising to see how difficult it is to liberate our minds from preconceived notions. Finally, it is essential that every conclusion must be rigorously tested and verified by honest experiment.

The results appear as a simplification or limitation of the conceivable possibilities. For instance, the whole material universe appears to be built up from perhaps only two constituents arranged to form fewer than 100 elements, and these are combined in accordance with immutable laws. Sometimes an advance in science is made by the boldest flights of the imagination, at other times it turns on increasing refinement of measurement. There is room for the most varied types of men, provided that they are devoted to the service of truth. Indeed, it is rare for any discovery to be the work of one unaided individual. Most great advances are cooperative, usually they are international, and without free international exchange of ideas, progress is crippled.

The value of refined measurements is so great that I should like to stress what has been pointed out before, that the laboratory that buys a refined scientific instrument is purchasing the thought and skill of all the preceding investigators who made the instrument possible and of the mechanics that brought it into being, thus involving and bringing to bear a great quantity and variety of skill and labor. Such weapons are clearly essential in all scientific laboratories; it is obvious that they will always be expensive and that there will never be finality in the case of any single instrument, each will be improved as knowledge advances. This is an added argument for liberal endowments for equipment and materials.

During the war there was created at Shawinigan Falls in Canada a colossal plant utilizing water power comparable with that which is obtained from Niagara. From coal and limestone they managed to produce on an enormous scale substances like acetone, acetic acid and alcohol. Their proud boast was that these great chemical achievements were entirely the cooperative work of a group of men who were just ordinary chemists.

The chief characteristic of the truly scientific man is the research outlook, detachment of mind and habit of resource; for remember, a mere knowledge of facts or principles does not make a scientist. It is a very partial or even sham knowledge which does not see the implications of a subject and is unwilling to face the test of further crucial experiment. We must take to heart the candid and pregnant words of Faraday, who was one of the most successful experimenters and profound thinkers whom chemistry or physics has known:

> The world little knows how many of the thoughts and theories that have passed through the mind of a scientific investigator have been crushed into silence and secrecy by his own severe criticism and adverse examination, that in the most successful instances not a tenth of the suggestions, the hopes, the wishes, the preliminary conclusions, have been realized.

The central position in pure science is necessarily occupied by research, and a special responsibility rests upon the workers in this field to be single-minded in the pursuit of truth and careful in their acceptance of evidence. Results which are not communicable and not verifiable are not science. Whereas formerly a scientific theory might wait even for generations before any further attention was paid to it, nowadays

every advance in pure science is immediately seized upon and applied in the most unexpected directions. Illustrations might be found in any of our large chemical industries—as, for example, that of artificial silk. Or, again, observe how quickly the comparatively recent intangible electron theory has created wireless and its related industries. Even the newly discovered and not yet isolated element hafnium is already being applied in wireless valves. Or we might consider such discoveries as those of radium and insulin. Indeed, during the last twenty years, applications of science in medicine have added ten years to the average expectation of life. Every process we employ, every device and invention of which we take daily advantage in our factories is the result of some former, may be forgotten research.

Some seed corn must be returned if the future is to repeat the successes of the past. Knowledge is power, and it is through scientific knowledge that we gain control over nature.

However, it is not upon utilitarian grounds that we present the claims of science upon the educated community. I would quote the words of President J. E. Barton of our Bristol Rotary (a movement which came to us in England from you):

> The real world is not the world of material prosperity or lack of prosperity. The real world is the world of science and discovery, of art, literature, emotion and passion. These are the things which give color and texture to experience.

J. W. N. Sullivan in his "Aspects of Science" has rightly emphasized that scientific research is thoroughly human; it is at once tentative, imaginative and courageous. In science we find a sense of unlimited possibilities, of adventure and of exultant hope.

In such men as Kelvin and Newton and Willard Gibbs we find the modern prototypes of Aristotle and Archimedes. "Science again affords theories and objects of contemplation which are as delicate, as subtle, as harmonious as the dreams of Plato—and much better founded." Many scientific theories are objects of surpassing beauty. Their innate truth appeals as directly to us as that of a great work of art. It is in this sense that Dr. Norman Campbell has written that "science is the noblest of the arts."

Science is bound to become an integral part of the culture of the future. It is profoundly influencing our conception of the universe and of man's place therein. A liberal education must have some acquaintance with the trend of the new physics, chemistry, biology and psychology, for they are too obviously pertinent to all man's chief preoccupations to be ignored.

Many of the convictions which I have expressed are felt by all scientists, although we do not often care to voice them. They underlie all our efforts in the training of our students, the primary object of university work.

I have tried to justify the statement with which I commenced that this far-sighted benefaction will have long consequences.

It is with these high hopes that we dedicate the Metcalf Chemical Laboratory of Brown University.

JAMES W. MCBAIN

BRISTOL, ENGLAND

SOME ASPECTS OF THE RELATION OF SPECIES TO THEIR ENVIRONMENT[1]

THE close relation between an individual plant or animal and its surroundings is strongly emphasized. It is recognized that the conditions under which it lives may affect its size, its form, its habits and its methods of reproduction. But the influence of the environment on the groups of individuals which we call species, while recognized, seems not to be given the weight that it deserves. It seems to me, at least, that the environment may play a greater part than is indicated by many of the current writers. While the germ plasm is no longer generally regarded as being as completely isolated and independent as set forth by Weismann, and while most workers recognize the action of the environment in cutting off certain individuals and so maintaining the characters of the species within certain limits, there seems to be a failure to recognize the extent to which external conditions determine that the species now living shall show the characters that they do show rather than some other characters. If this is true, if the collections of individuals which we call species show the characters by which we recognize these groups, not alone because of the inherent properties of their protoplasms, but also because of the molding action of the environment, does it not follow that we must assign to the environment a large share in determining the forms of the species as we recognize them to-day?

Many plants and animals, when transferred to new conditions, have changed their form and structure in response to their new surroundings. Criticisms of these results have usually brushed them aside with the statement that the descendants of these individuals return to their old form and structure when returned to the old conditions. These criticisms seem to fail to recognize the fact that the species show the form and structure which we describe as characteristic for them only under a particular set of conditions. We can not doubt that, if the conditions on the earth were different from what they are, we should have our plants and animals showing different groups of characters from those which they now show. In other

[1] Address of the retiring president of the Association of Virginia Biologists, Norfolk, Virginia, April 27, 1923.

words, we should have different species, as we recognize species, from those which we now have. Stockard, exposing the eggs of a marine fish, *Fundulus*, to sea water with the addition of certain magnesium salts and to some other substances, obtained developing young showing marked differences from the characters usually shown, notably the development of one-eyed fish. Sometimes this single eye was on the side of the head, and sometimes in the middle of the forehead, giving a cyclopean form. It seems that, in these fish, the two eyes will develop in their usual places if the eggs are exposed to untreated sea water, but that various modifications of eye development and location appear if the sea water contains an unusual amount of certain magnesium salts. If, now, the sea water regularly contained larger amounts of these magnesium salts, should we not have these unusual forms of the eye as the usual characteristics of the species? In that case, by removing some of the magnesium salt we should obtain "abnormal" forms bearing two eyes, one on each side of the head. We can not too strongly emphasize the fact that many of the so-called abnormalities are normal developments under particular conditions. This seems, upon consideration, to be self-evident, but, while admitted by the tongue, is, I believe, frequently ignored by the mind of many a present worker.

The periodicity shown by several different kinds of plants and animals is probably an example of the molding action of the environment on these organisms. The marine alga, *Dictyota*, has been found to produce its sexual cells periodically in all places where it has been studied, but it has also been found to have one type of periodicity in Europe, a second type on the coast of North Carolina, and a third type in Jamaica. Moreover, while showing the same type of periodicity in Wales, England, and Italy, it has a different time of fruiting in each of these regions. On the other hand, at the two widely separated localities where this alga has been found on the Atlantic coast of the United States, it fruits on the same days at both places. While we have not yet been able to analyze the factors concerned here, we can scarcely conceive of this result being obtained in any other way than by the response of the plant to the conditions of its environment.

The fact of the effect of the environment on species is, I believe, unquestionable, but the manner of its effect is open to indefinite discussion. We may conceive of this as acting solely by directing and molding the development of the individuals, suppressing certain capacities and bringing others to expression. It is undoubtedly true that every individual has more inherent potentialities than are ever brought to expression. On the other hand, an individual can never develop structures or habits for which it has no inherent capacities. If the fish used in the experiments of Stockard had not had the capacity to respond to the presence of increased amounts of magnesium salts they would not have shown any such responses to these salts. The question immediately arises, then, Can conditions of the environment alter the inherent potentialities of individuals and finally of the race? Can acquired characters be inherited? I am aware that it is unorthodox to present-day biology to even raise this question, but I do not believe that the final answer to it has been given. The term "acquired characters" seems to be used in two senses—one, in the stricter sense, referring only to those cases where the inherent capacities of the organisms have been changed; the other including the cases where the effects of the molding action of the environment are inherited by subsequent generations without the direct influence of these factors of the environment. In the one case there will have been an alteration by the changed environment of the inherent potentialities of the organisms, in the other case the inherent potentialities already present will simply be brought to expression. Conklin, in his treatment of heredity nad environment, limits the discussion of the inheritance of acquired characters to the inheritance of particular characters such as hypertrophied heart or loss of sight and uses the term "induction," for the continuance in later generations of other characters which have been produced in the parents in response to changes in the external conditions. He states:

> Probably such changes are not instances of true inheritance; they do not signify a change in the hereditary constitution but an influence on the germ cells of a nutritive or chemical sort comparable with what takes place when fat stains are fed to animals; the eggs of such animals are stained, and the young which develop from such eggs are also stained, though the germinal constitution remains unchanged. The very fact that the changed condition is reversible and that it disappears within a short time is evidence that it is not really inherited.

Such discussion seems to me to show too limited an interpretation of the results. It seems comparable with the discussion of the failure of mutilations to produce effects on subsequent generations. It is obvious that mere changes in the form of individuals exposed to new conditions do not indicate acquired characters. The conditions may have affected only the material of the body and not have reached and affected the germ cells. But when the offspring of such plants or animals, produced after the return of their parents to the original environment, continue to show these changes for one or more generations, are not these to be properly regarded as examples of the inheritance of acquired characters? Such effects can be transmitted only through the germ plasm, and their

appearance in later generations shows that the germ plasm has been affected and altered. The fact that the descendants of such individuals return to the original state upon their return to the original conditions would seem to indicate only that they have again shown their capacity to respond to a changed environment. We can not call either the original or the altered form normal, for each is "normal" to the particular set of conditions under which it develops. Moreover each form is capable of yielding descendants showing the parental characters only if the successive generations are maintained within the environmental range which produces that particular set of characters. In this sense we may regard the characters ordinarily shown by a species as being acquired, since these are maintained only under the conditions under which the species ordinarily lives and must, therefore, be regarded as developed in response to these conditions and impressed by these conditions on the germ plasm. A full description of a species should include not only the characters which we ordinarily recognize, but a statement of the conditions under which these develop, together with all other characters which the species may show under other conditions. Surely, the potential characters are as much a part of the species as the expressed characters. It is only the chance of the environment that makes one set of characters expressed and keeps another set suppressed and potential. We have not yet such a description of any species, but only when we have this can we believe that we really know the species.

As to the means by which the environment accomplishes its results we still know almost nothing. Results of great importance to this question will, I believe, be obtained in the future from careful experiments carried on for many years. I believe, for example, that the effect of use and disuse is still to be determined by a series of properly conducted experiments. For this the caves abounding in some parts of Virginia seem to offer an excellent opportunity to determine the manner in which many cave animals have become blind. Such work should be done under the auspices of some organization which could continue the studies with the necessary care for several decades or possibly centuries, but could be expected to yield results of fundamental importance and lasting value. Whether the environment can or can not produce new characters within a species, altering its inherent capacities, is still open to question. But, however this may be, we can not doubt that our species are what they are partly because of the molding action of the environment; and a true interpretation of the evidence shows, I believe, that, in many cases, the external conditions affect the germ plasm as well as the body material and consequently have their effects shown in a smaller or larger number of succeeding generations.

W. D. HOYT
WASHINGTON AND LEE UNIVERSITY

GRANTS IN SUPPORT OF RESEARCH

THE opinion seemingly is prevalent that research is inadequately supported in the United States of America and that small grants are especially difficult to secure. Undoubtedly it is true that larger resources could be used to advantage in the promotion of scientific inquiry. Nevertheless, it should be recognized that very large sums are now available for research and that numerous sources of small emergency grants exist.

This note is written chiefly because the opinion of many investigators appears to be at variance with the experience of committees on grants. The former tend to consider it either impossible to secure assistance or scarcely worth the effort. The latter, on the contrary, are frequently surprised by the scarcity of meritorious requests and the necessity of inviting or even urging investigators to present their needs. Not infrequently committees responsible for special funds are unable to make awards because of this dearth of applications.

The experience of the writer as one-time director of the Research Information Service of the National Research Council and as a member of the Committee on Grants of the American Association for the Advancement of Science convinces him that investigators too often are not familiar with even the more important sources of funds, and strangely careless about informing themselves and presenting applications which permit intelligent committee action. There seems also to be a reluctance on the part of some investigators to ask aid because of the possibility of refusal. This attitude is unfortunate alike for committee responsibility in the distribution of funds and for the progress of research. It is obviously and highly desirable that every investigator whose original work demands additional funds for its proper conduct make known his needs fully and convincingly to the officers of appropriate sources.

Although not all investigators may reasonably be expected to be familiar with the multitudinous sources and forms of support of research in this country, any intelligent and determined individual should be able to assemble pertinent information on need. The Research Information Service of the National Research Council two years ago issued a bulletin on "Funds available in 1920 in the United States of America for the encouragement of scientific research." This publication has been distributed widely and is still avail-

able to investigators who desire to utilize it. A revised edition is in preparation for issuance in 1924.

The Committee on Grants of the American Association for the Advancement of Science earnestly invites the attention of investigators to the fact that the Association distributes annually from four to five thousand dollars in small grants, usually of less than $500. The Committee often has too few applications for aid. It never has had too many good ones! This undoubtedly is the experience also of similar bodies. Whether or not available funds for small grants are entirely adequate, it is reasonably certain that existing funds are not being used to the best possible advantage because investigators do not take the trouble to get their needs before the administrators of appropriate sources.

In so far as possible the Research Information Service of the National Research Council will advise inquirers about possible and appropriate sources of support and will thus enable them to communicate directly with special committees or other bodies.

ROBERT M. YERKES,
Chairman

COMMITTEE ON GRANTS OF
THE AMERICAN ASSOCIATION

JACOB ROSENBLOOM

ON September 25, 1923, there died in Pittsburgh Dr. Jacob Rosenbloom, the eminent metabolist. In him America lost an ardent lover of science, and biochemistry a prominent contributor to its progress.

I met Dr. Rosenbloom thirteen years ago when he was twenty-five years old. At that time he was a living dynamo, working fifteen to eighteen hours daily in the laboratory on several problems in biochemical research simultaneously. His mind was one of the alertest that I have known. He constantly read the scientific literature published all over the world, and, with the most tenacious memory, retained and indexed his gleanings so that he could throw light at any moment on any problem in the very diverse fields of medicine and biochemistry.

His tastes were catholic. His reading was as diverse as literature itself. He spent very little time in the enjoyment of the trivialities of life. His laboratory and his library were his places of recreation and repose.

Dr. Rosenbloom was born in Braddock, Pennsylvania, on February 25, 1884. He received elementary and high school education in the local schools and then entered the University of Western Pennsylvania, from which he was graduated in the year 1905 with the degree of Bachelor of Science. His professor at the university was Dr. Francis Phillips, a man who has left his mark on American chemistry. Professor Phillips prophesied a brilliant future for Dr. Rosenbloom's chemical attainments, and he remained his friend and admirer until his own demise. From Columbia, Dr. Rosenbloom received the degrees of Doctor of Medicine and Doctor of Philosophy. Later on he was appointed biochemist in the Western Pennsylvania Hospital of Pittsburgh and assistant professor of biological chemistry in the University of Pittsburgh.

His specialty in medicine was the diseases of metabolism, and he was the first man in the United States to recognize such a specialty, to enter it and to find many imitators.

Dr. Rosenbloom was generous to a fault. His time, his purse and his labors were always at the command of his friends. One can conceive of the generosity of his mind when one is told that knowing that his time for research was limited, he published at his own expense a brochure entitled "1000 problems in biochemical research" and freely distributed it to his friends and enemies for them to grasp these suggestions and to work out these original thoughts of his.

He has contributed more than one hundred reports of original research to the various medical and biological journals of America, England and Germany. Those who have read his works will feel greatly the loss that science sustains.

Towards the later years of his young life, Dr. Rosenbloom devoted much time to the history of medicine and he had made several interesting contributions to that subject in the *Annals of Medicine* and in *Medical Life*. He has asked the author of these lines before he died, not knowing that he was going to die, to collaborate with him in the publication of a volume on "Critical Studies in the History of Medicine." This volume is ready and will soon be submitted for publication.

MAX KAHN

NEW YORK, N. Y.

SCIENTIFIC EVENTS

BRITISH AGRICULTURAL RESEARCH[1]

ROBERT HUTCHINSON, president of the National Association of British and Irish Millers, read a paper on "The Economic Basis of Wheat-growing in England" at the annual meeting of the fellows of the National Institute of Agricultural Botany on November 2. The only way, he said, of preventing the area under wheat from being further reduced was to raise the price to a profitable level. This is not impossible if a wheat is obtainable which combines with the productivity, the stiffness of straw and the resistance to disease of the best English wheats, the "strength" which puts so high a premium on the best Canadian wheats. "Strength" is the mysterious factor which

[1] From *Nature*.

determines the size, shape and palatability of a loaf. For many years it was believed that a strong wheat could not be grown on English soils or in the moist English climate. Wheats imported for experimental purposes from Canada, Russia, Hungary and Turkey all lost their quality within a few years. But one wheat, Canadian Red Fife, has been proved to retain its strength unimpaired after 21 successive years' growth in England. Professor R. H. Biffen, working on Mendelian lines, has proved that strength is a dominant characteristic, and by crossing Red Fife with high-yielding English wheats has already given the farmer Yeoman wheat, which without admixture of foreign wheats will yield satisfactory bread. But, in Professor Biffen's own words, the sooner Yeoman is off the market the better, for a series of new wheats believed to combine the best characteristics of Canadian and English varieties, and adapted to different types of soils, are now growing at the Cambridge Plant Breeding Institute, and it is hoped to market the first of these through the National Institute of Agricultural Botany in the autumn of 1924. If the promise of these wheats materializes, English wheat will be lifted from the category of kinds to be bought for breadmaking only when the price is low into the category of kinds desired and essential. This change would revolutionize the financial prospects of English wheat-growing.

Of recent years the great development of agricultural education and research in Great Britain has attracted considerable attention throughout the empire. The number of research workers spending some time at centers such as the Rothamsted Experimental Station is rapidly increasing. In the majority of cases they are sent officially by the dominion government concerned. A further example of this cooperation is furnished by the recent departure of Sir John Russell, director of the Rothamsted Experimental Station, on a special mission to the Sudan. He will be associated with Dr. H. Martin Leake, director of agriculture for the United Provinces of India, in advising the Sudan Government on its agricultural policy. In view of the enormous possibilities for growing cotton in the Sudan, agricultural research work will be mainly concerned with cotton. The first instalment of the great irrigation scheme in the Gezira plain south of Khartoum is expected to come into operation in the autumn of 1925. At this stage 300,000 acres will be put under irrigation, of which 100,000 acres will be under cotton; but the total scheme is capable of development over an area of 3,000,000 acres. In approaching Sir John Russell and Dr. Leake, the Sudan government has been actuated by the desire to get the best possible advice as to the organization and direction of the agricultural research work which should be undertaken in connection with this project, which may ultimately produce 1,000,000 bales of cotton a year. It is hoped that the Empire Cotton Growing Corporation will cooperate with the Sudan government in the research work to be carried out, and that this work can be coordinated with a general plan for research work on cotton problems to be organized throughout the British Empire.

BRITISH EXPEDITION TO SAMOA

THE research expedition arranged by the London School of Tropical Medicine, which is going out to Samoa to study the prevention of filariasis and associated diseases, especially elephantiasis, according to the London *Times*, has left Southampton in the *Athenic* for New Zealand, *via* Panama.

It consists of Dr. P. A. Buxton, the well-known zoologist, entomologist and medical man; Mrs. Buxton and Mr. G. W. Hopkins, of Downing College, Cambridge. In New Zealand, they hope to add to their company one or two New Zealand medical students, who will thereby be given opportunity of studying some of the problems of disease which the government of their dominion will have to face in connection with its mandate over such areas as Samoa.

It is hoped to be able to demonstrate that the infecting of man (animals are never infected) by the mosquito "carrier" of the filaria can be prevented by clearing away all the undergrowth round the masses of coconut palms, destroying the broken shells, thrown on one side in making the copra, which harbor water, and by destroying the rhinoceros beetle, which bores into the tree holes that retain moisture in which the mosquito breeds. The natives meanwhile will be carefully supplied with water from uncontaminated cisterns.

Elephantiasis is largely responsible for the apathy and lack of initiative on the part of the Polynesian, making necessary the introduction of Chinese and Indian labor for developing many natural resources. Filariasis also has a very serious effect on the birth rate. So far no drug is known which will destroy without killing the patient the hair-like worm (the males are 1½ inches long and the females 3 inches) which lives in the lymphatic glands.

The influenza epidemic of 1918 carried off nearly a third of the people of Samoa, tuberculosis is increasingly attacking men and women of marriageable age, and measles is usually fatal. All these problems are also to be studied by the expedition, as well as the dysentery epidemic which has been particularly bad this year. It is hoped to be able to arrange for the training of two or three native women in each village for infant welfare work. Especially important will be the researches into the effect of high atmospheric temperatures and moisture on the European. Dr. Buxton is also expected to make a study of the birds of

Samoa, and it is hoped he will be able to bring home to London a "didunculus," the first cousin to the extinct dodo, which still survives in one area. A careful selection of entomological specimens will also be made.

THE COLLEGE OF DENTISTRY OF THE UNIVERSITY OF CALIFORNIA

RECOGNITION of the work of the college of dentistry of the University of California is shown by the grant to it for three successive years, by the Research Commission of the American Dental Association, of funds for carrying on special investigations. For 1922–23, according to a statement made by Dr. Guy S. Millberry, dean of the College of Dentistry, the principal grant amounts to $2,000 and is awarded for research to be carried on by Dr. John A. Marshall, associate professor of biochemistry and dental pathology, in the influence of diet and nutrition on the development of the teeth. Dr. Marshall will also with the aid of this grant continue certain inquiries into the "salivary factor in dental decay" and into "dental erosion."

In addition, the research commission has made a grant of $1,500 to the university research group now carrying on experimental work in San Quentin Prison. This study is concerned with infections of the oral cavity. The investigators include Dr. Vance Simonton, associate professor of operative dentistry, Dr. W. Hanford and Dr. W. Fleming, instructors in preventive dentistry, Dr. C. O. Patten and Dr. C. Westbay, instructors in operative dentistry, for the College of Dentistry. Particularly concerned, also, in the chemical side of the research is Dr. Guy W. Clark, assistant professor of pharmacology, while similarly engaged on the bacteriological side are Associate Professors T. D. Beckwith and I. C. Hall.

The College of Dentistry will next January begin to use the income from a fund of $10,000 to meet the expense of an annual course of lectures, by noted authorities, on preventive dentistry. These lectures will at first be given in San Francisco, but as the fund increases through the efforts of the Alumni Association of the college they will be repeated in other centers of population. According to Dean Millberry the northern branch of the Dental Alumni Association is now committed to the raising of a quota of $5,000 to add to the $10,000 already in the hands of the Board of Regents.

THE MILBANK MEMORIAL FUND

IN the report of the Milbank Memorial Fund, established by the late Mrs. Elizabeth Milbank Anderson, recently issued, it is stated that $2,000,000 has been appropriated for health demonstrations in three typical communities with a population of half a million.

Under the plan announced the fund will attempt to demonstrate, by cooperation with agencies in these communities, whether the extent of sickness can be materially diminished by the intensive application of known health measures, and mortality rates further reduced; and whether these results can be achieved in a relatively short period of time and at a per capita cost which the communities will willingly bear.

"This project of the Milbank Memorial Fund, known as the New York Health and Tuberculosis Demonstrations, will be carried on in three localities in New York State typical of metropolitan, city and rural communities in the country at large. It will be conducted under the general supervision of a group of well-known leaders in public health and social work. Its purpose is to determine which diseases more readily yield to concerted attack, to what extent tuberculosis can be further reduced, whether the low infant mortality rate of 50 per 1,000 born attained in many progressive communities can be generally substituted for the rate of 100 or more still prevailing in parts of the United States; what preventive methods are most effective in controlling disease—in short, to ascertain what can be accomplished by the intensive application of public health measures in the fields of physical and mental, social and industrial hygiene. A record will be kept of the exact cost of each specific project and every effort made to keep the cost down to a minimum consistent with efficiency."

Actual work has been started in Cattaraugus county, with a population of about 72,000 and in the city of Syracuse, which has a population of about 175,000. The metropolitan district, though not yet definitely located, will probably be a section of New York City, with a population of about 200,000. The Board of Directors of the fund has set aside $325,000 annually for these projects.

The general supervision of the demonstrations will be in the hands of a technical board consisting of Dr. James Alexander Miller, of the College of Physicians and Surgeons; Dr. Linsly R. Williams, managing director of the National Tuberculosis Association; Dr. Livingston Farrand, president of Cornell University; Homer Folks, secretary of the State Charities Aid Association; Bailey B. Burritt, director of the New York Association for Improving the Condition of the Poor, and John A. Kingsbury, secretary of the fund.

ATTENDANCE AT SCIENTIFIC MEETINGS

THE following resolution was adopted by the Board of Managers of the Washington Academy of Sciences at a meeting held October 29, 1923:

Whereas, The work of scientific men has contributed enormously to the welfare of the human race and espe-

cially to the people of the United States of America, and

Whereas, The government of the United States has recognized the importance of scientific investigations and research by the creation of many scientific bureaus, and has appropriated large sums of money for carrying on their work which has been most beneficial to the health, industries and commerce of this country, and

Whereas, Our people should be kept informed promptly and fully of the progress made and results accomplished by the scientific organizations of the government, and

Whereas, The members of the government engaged on scientific activities can only function to the best advantage by having conferences with scientific men of this country not in government service and with such men of other countries, and

Whereas, This contact can only be gotten by attendance at scientific gatherings in this country and abroad; therefore, be it

Resolved, That the Washington Academy of Sciences hereby petition and urge the President, the heads of departments of the federal government, and the Congress of the United States to give the welfare of science in the United States their earnest consideration and assistance; and to provide by law and by appropriation of the necessary money for the attendance of such scientists of the government as heads of departments may designate at scientific congresses, conventions and meetings in this country; and for the attendance of such scientists of this country, both in the government and in private life, as may be recommended to the Department of State by competent authority and approved by the head of that department or the official acting for him, as representatives of the United States of America at international scientific congresses, conventions and meetings. These appropriations would be exceedingly small as compared with the returns from them in great benefits to scientific advance in America and hence to the promotion of the national welfare.

PRIZE OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

To mark the seventy-fifth anniversary of the American Association for the Advancement of Science, a member of the association has given the sum of one thousand dollars to be awarded as a prize to the author of a paper containing a notable contribution to the advancement of science, presented at the Cincinnati meeting either before the association or before one of the affiliated societies. The award will be made by a committee to be appointed by the council of the association.

SCIENTIFIC NOTES AND NEWS

THE Nobel Prize for chemistry has been awarded to Professor Friedrich Pregl, of Graz. It will be remembered that the Nobel prize in physics has been awarded to Professor R. A. Millikan, and the prize in medicine to Professor J. J. R. Macleod and Dr. F. G. Banting.

SIR CHARLES SHERRINGTON, Waynflete professor of physiology at Oxford, has been nominated by the council of the Royal Society for reelection to the presidency. Awards of medals have been made as follows: Royal Medals to Sir Napier Shaw, F.R.S., for his researches in meteorological science, and to Professor C. J. Martin, F.R.S., for his researches on animal metabolism. The Copley Medal to Professor H. Lamb, F.R.S., for his researches in mathematical physics. The Davy Medal to Professor H. B. Baker, F.R.S., for his researches on the complete drying of gases and liquids. The Hughes Medal to Professor R. A. Millikan, of the California Institute of Technology, for his determination of the electronic charge and of other physical constants.

THE first award of the Thomas Turner gold medal was made on October 30 to Sir Robert Hadfield, Bart., in recognition of his distinguished contributions to metallurgy of steel. The medal is the outcome of a gift to perpetuate the memory of the work done by Professor Turner in the metallurgy of iron.

THE honorary fellowship of the American College of Surgeons was conferred upon Sir William Wheeler, president of the Royal College of Surgeons of Ireland, at the convocation ceremony in Chicago on October 26.

DR. ALEXANDER RUSSELL, principal of the Faraday House Electrical Engineering College, London, has been elected president of the British Institution of Electrical Engineers.

DR. A. LIPSCHUTZ, professor of physiology at Dorpat, has been elected to honorary membership in the Mexican Biological Society.

OFFICERS of the Cambridge Philosophical Society have been elected as follows: *President,* C. T. Heycock; *vice-presidents,* Professor A. C. Seward, Dr. H. Lamb, J. Barcroft; *treasurer,* F. A. Potts; *secretaries,* Professor H. F. Baker, F. W. Aston, J. Gray; *new members of the council,* F. P. White, E. V. Appleton, J. B. S. Haldane.

PROFESSOR LYMAN C. NEWELL, of Boston University, was delegate from the American Association for the Advancement of Science at the celebration of the fiftieth anniversary of Boston University, which occurred on October 25 and 26.

ARTHUR P. DAVIS, whose dismissal as director of the Reclamation Service by Secretary Work caused many protests from engineering and other bodies, has been elected to honorary membership by the Washington Society of Engineers. Mr. Davis is now in England, representing the Department of State on

engineering matters coming before the Pecuniary Claims Commission.

C. E. HALSTEAD, of the Research Laboratories of the Ward Baking Co., New York, is returning to Syracuse University after a two years' leave of absence.

THROUGH the courtesy of the Danish Government, the Academy of Natural Sciences, of Philadelphia, was enabled to send Samuel G. Gordon to southern Greenland for mineralogical research. Camps were established at Narsarsuk and the various localities on the Tunugdliarfik and Kangerdluarsuk Fiords. Mr. Gordon left England on the S. S. *Lom* on July 1 and returned to Philadelphia on November 11.

A DESPATCH from Berlin to the daily papers reports that Professor Albert Einstein, who left Germany largely because of outbursts of anti-Jewish sentiment, is residing in Leyden, The Netherlands, where he holds a chair of physics in the university and where he plans to stay until conditions in Germany improve sufficiently to allow of his return to Berlin.

DR. W. T. BOVIE, of the Harvard Medical School, gave a lecture before the Franklin Institute of Philadelphia on November 8 on "The electro-mechanics of cell growth."

SIR JAGADIS BOSE, director of the Bose Institute, Calcutta, will deliver a lecture at the Royal Society of Medicine, London, on "Assimilation and Circulation in Plants," on December 6. It will be illustrated on the epidiascope with the apparatus in operation.

DR. A. V. HILL'S inaugural lecture as Jodrell Professor of Physiology at University College, London, on "The present tendencies and the future compass of physiological science," will shortly be published by the University of London Press.

DR. ARTHUR L. DAY, director of the geophysical laboratory and chairman of the advisory committee in seismology, Carnegie Institution of Washington, gave an illustrated lecture before the institution on November 27, on "Cooperative earthquake studies in California."

AT the quarterly meeting of the Medico-Psychological Association of Great Britain and Ireland on November 22, Professor D. C. Winckler gave an address on the psychiatrical and neurological teaching at the Dutch universities, especially at the University of Utrecht, where he is the director of the psychiatric-neurological clinic.

THE Thomas Vicary Lecture before the Royal College of Surgeons of England will be delivered on December 7, by Sir Arthur Keith, F.R.S., the conservator. The lecture will be on the life and times of William Clift, first conservator.

A MEETING will be held at Clark University on the evening of December 7, in memory of Arthur Gordon Webster. President W. W. Atwood will preside, and Dr. A. P. Wills, of Columbia; Dr. Edwin H. Hall, of Harvard; Dr. M. I. Pupin, of Columbia, and Dr. G. Stanley Hall will speak.

JAMES SULLY, formerly professor of mind and logic at University College, London, known for his publications on psychology, died on November 2, at the age of eighty-one years.

EDMOND KNOWLES MUSPRATT, honorary president of the United Alkali Company and long associated with the English alkali and acid industry, a former pro-chancellor of the University of Liverpool, at which he endowed the laboratory of physical chemistry, has died at the age of ninety years.

DR. W. P. LATHAM, formerly Downing professor of medicine at the University of Cambridge, died on October 29, in his ninety-second year.

DR. T. H. GREEN, formerly physician to Charing Cross Hospital and author of a text-book of pathology well known to many generations of students, died on November 5, in his eighty-first year.

DR. JEAN PAUL LANGLOIS, professor of physiology in the University of Paris and editor of the *Revue Générale des Sciences,* died recently at the age of sixty-two years.

THE British Empire Exhibition at Wembley will include, as we learn from *Nature,* a pure chemistry exhibit, organized by a committee representing the relevant scientific societies, supported by the cooperation of the Royal Society. The following have agreed to organize the various sections of the chemical exhibit: Sir Ernest Rutherford (structure of the atom), Professor J. C. McLennan (spectroscopy), Sir Henry Miers (crystallography and crystal structure), Dr. A. Lapworth (valency theories and theories of chemical combination), Dr. T. Slater Price (photography), Professor F. G. Donnan (general physical chemistry), Dr. Alexander Scott (atomic weight determination), A. Chaston Chapman (analysis: hydrogen ion concentration), Professor E. C. C. Baly (general inorganic), Professor A. Smithells (flame, fuel and explosion waves), Dr. Henry and Prof. F. L. Pyman (organic chemistry), J. L. Baker (biochemistry), Sir John Russell (agricultural chemistry), Principal J. C. Irvine (sugars), Professor G. G. Henderson (terpenes), Professor I. M. Heilbron (plant coloring matters), Dr. J. T. Hewitt (coal-tar coloring matters), Professor J. F. Thorpe (general organic chem-

istry), C. F. Cross (cellulose), Dr. E. F. Armstrong (catalysis), W. F. Reid (explosives), Dr. W. R. Ormandy (plastics), Commander R. E. Stokes-Rees (apparatus), Professor J. W. Hinchley (chemical engineering), R. B. Pilcher (historical).

STUDENTS completing their work at Washington University for the doctorate of philosophy in the graduate laboratory in June, 1923, have been appointed to positions as follows: Dr. H. C. Young, chief in botany at the Ohio Experiment Station; Dr. A. F. Camp, plant pathologist to the Florida State Board of Agriculture and assigned to the Agricultural Experiment Station at Gainesville; Dr. L. J. Klotz, assistant professor in botany with special reference to physiology at the New Hampshire State College, and Dr. Grace E. Howard, curator of the botanical museum and instructor in botany, Wellesley College. Dr. S. G. Lehman has returned to his position as assistant plant pathologist at the North Carolina Agricultural Experiment Station, Raleigh, N. C.; Dr. F. S. Wolpert continues his work as instructor in science, Principia Academy, St. Louis; and Dr. Adele Lewis Grant has resumed her work as instructor in botany at Cornell University. Dr. Young formerly held the National Research Council (Crop Protection Institute) Fellowship for the investigation of the toxicity of sulphur; Drs. Camp, Klotz and Lehman were Rufus J. Lackland Research Fellows, and Miss Howard held a Jesse R. Barr Fellowship in Washington University. Upon the resignation of Dr. H. C. Young, Mr. L. E. Tisdale was appointed to the unexpired term of the National Research Council Fellowship, under the auspices of the Crop Protection Institute, to pursue further investigations on the use of sulphur as a fungicide.

THROUGH the good offices of Professor T. D. A. Cockerell, of the University of Colorado, who has recently returned from a trip to the East, the Department of Agriculture has received an interesting collection of seeds of cereals, forage plants, vegetables and fruits from the Maritime Provincial Agricultural Bureau, Vladivostok. The collection contains more than 250 local varieties collected in Siberia. Since the climate of the section in which these seeds were obtained is quite similar to that of certain parts of the United States, it is believed that many of the varieties will prove of considerable value to the agriculturists of this country. The department has sent an assortment of cereals to the Maritime Agricultural Bureau in exchange for the seed supplied by them.

THE establishment of a Sears-Roebuck agricultural research foundation to determine essential facts relating to the farming industry is announced by Julius Rosenwald, president of the Sears-Roebuck Company. He said the foundation will be headed by "the most capable men to be found in the agricultural research field." A field force also is contemplated. The announcement set out that every phase of agricultural economics will be studied.

A GIFT of $2,500 a year, for three years, for a research fellowship in connection with the newly organized Institute of Meat Packing at the University of Chicago has been made by Mr. Arthur Lowenstein, vice-president of Wilson and Company. This research will be carried on under Professor E. O. Jordan, chairman of the department of bacteriology of the university. Mr. Lowenstein is one of the special lecturers in the Institute of Meat Packing at the university as well as chairman of the committee on scientific research of the Institute of American Meat Packers.

THE following resolutions were passed by the National Research Council at the meeting of the Interim Committee held on October 3:

"*Whereas,* An accurate knowledge of thermal effects connected with chemical processes is of the highest importance to the chemical and metallurgical industries, and whereas there does not exist in this country at the present time any bureau, laboratory or other organization devoted to investigations in this field; therefore, be it

"*Resolved,* That the National Research Council, acting upon the recommendation of the Division of Chemistry and Chemical Technology, direct the secretary to bring this matter to the attention of the director of the Bureau of Standards and urge him to create within the Bureau of Standards a laboratory which shall be devoted primarily to research in this field; and further, be it

"*Resolved,* That the National Research Council assist and support the director of the Bureau of Standards in any efforts which he may make in this direction."

WE learn from *Nature* that at a meeting of the Linnean Society of New South Wales held on August 29, a proposal for the reservation of all areas in New South Wales with altitude greater than 4,000 feet was discussed, and it was resolved "that this society desires to advocate the reservation from alienation and the more conservative administration of the Crown Lands of New South Wales on which grow the upland forests at the sources of the principal rivers for the following considerations: (1) The quality and regularity of river supply, (2) the preservation of undergrowth and timber, and (3) the preservation of the fauna and flora of scientific value; and that the terms of this resolution be conveyed to the state government for consideration."

AGE distribution of Prussia's population has recently been reported to the *Journal* of the American Medical Association, as follows: The number of children in the 0–15 age group, in 1910, amounted to

35 per cent. of the population. In 1920 this percentage had decreased to 29, in spite of the loss of men in the war. The number of men in the 20–50 age group was, in 1913, almost 8,500,000, but in 1920 only 7,700,000. The number of children in the 6–15 age group fell from 5,100,000 to 2,770,000. If this rate of decrease continues, five years from now, the percentage of children in the 0–15 age group will scarcely exceed 20, and will doubtless fall below 20 during the years following. On the contrary, as compared with 1917 and 1920, the mortality of children under 6 and of school children has risen for both sexes, and measurements of school children and of minors who have left school prove that there has been a downward trend of bodily health.

THE work which the Bureau of Standards is carrying out on a dictionary of specifications has made good progress. During the past month existing specifications have been collected from more than 75 per cent. of the important national technical societies, trade associations and governmental publishing agencies that have issued specifications. A fairly accurate estimate can now be made of the total number of available specifications for use in preparing the dictionary. Leaving out all duplications, it would appear that about 5,000 specifications are available from the above sources. However, not all of these specifications can properly be classed as related to commodities purchased by the federal, state and municipal governments and public institutions. It is believed that about 20,000 commodities do come within this class and of these more than 75 per cent. of all commodities purchased for government consumption are not covered by available specifications.

THE following resolution was passed at the recent St. Louis meeting of the American Fisheries Society:

WHEREAS, The attention of the American Fisheries Society has been drawn to the very important work on fish diseases and parasites now being conducted by the New York State Conservation Commission; and,

WHEREAS, This society recognizes that such work is fundamental to the future conduct and policy of fish culture; and,

WHEREAS, The rapid growth of population and increase of travel are placing a special drain on fish life; therefore, be it

Resolved, That this society commends especially this research work and expresses the hope that the State of New York, through legislative enactment and financial assistance, when necessary, will continue to carry on this work, which is recognized to be of great benefit to the entire country.

THE *Journal of Industrial and Engineering Chemistry* reports that the largest sale of pulp timber ever made by the United States Forest Service was announced recently. The transaction involves 334,000,000 cubic feet of timber in the Tongass National Forest, Alaska. The buyer, the firm of Hutton, McNear and Dougherty, of San Francisco, has agreed as part of the consideration for the timber to build a pulp manufacturing plant of not less than 100 tons daily capacity, and ultimately with a daily capacity of 200 tons, at the Cascade Creek water-power site on Thomas Bay, 20 miles from Petersburg, Alaska, within the Tongass National Forest. It is understood that the firm plans to install a complete newsprint plant with a daily capacity of 200 tons. According to the plans of the Forest Service for this sale unit, as well as for all pulp timber developments in Alaska, the timber will be cut on a perpetual supply basis, enough seed trees being left to insure complete natural reproduction. The volume of pulp timber and the area of timber-growing land within the unit, reserved from other disposition, are sufficient to afford a permanent source of raw material for this enterprise. Under the perpetual timber supply plan at least 1,500,000 tons of paper can ultimately be produced in Alaska every year. This amount is more than one half of the newsprint now consumed annually in the United States and nearly 20 per cent. of the total consumption of all kinds of paper and wood fiber products. As each new unit of timber and water power is developed in Alaska, the manufacturing capacity will be gauged to the timber supply and growing power of the land so that there will be no depletion of raw material. The Cascade Creek sale is in line with the policy for the development of the national forest in Alaska, which was a subject of special study by President Harding during his trip to the Territory and which received his endorsement.

WE regret that through an error made in the office of SCIENCE a letter from Henry B. Ward, of the University of Illinois, printed in the issue for November 9, was dated from the University of Nebraska.

UNIVERSITY AND EDUCATIONAL NOTES

THE *Journal* of the American Medical Association reports that the Johannesburg town council has given $100,000 to the University of Johannesburg Medical School, South Africa, and $25,000 to the Victoria Hospital. Bids have been received for the erection of the new medical school at Grotte Schuur, near Cape Town, South Africa, at an approximate cost of $500,000.

DR. ERNEST ANDERSON has resigned as head of the general chemistry division at the University of Nebraska to become head of the department of chemistry at the University of Arizona, Tucson.

DR. V. H. YOUNG, professor of botany and plant pathology in the University of Idaho, has been appointed to succeed the late Dr. J. A. Elliott as professor of plant pathology in the University of Arkansas and pathologist in the Agricultural Experiment Station.

STEWART A. KOSER, of the U. S. Bureau of Chemistry, has been appointed assistant professor of bacteriology at the University of Illinois.

JOHN L. BUYS, of the University of Akron, has become professor of biology in St. Lawrence University, Canton, N. Y. A. L. Leathers, Ph.B. (Wesleyan '07), Ph.D. (Cornell '16), will teach zoology at Akron.

CARL GEISTER, of the chemistry section of the Iowa Engineering Experiment Station, has been appointed to the fellowship of the Vitrified Tile Floor Association at the Mellon Institute of Industrial Research.

DR. JOHN RONALD CURRIE, professor of preventive medicine, Queens University Faculty of Medicine, Kingston, Ont., has been appointed Henry Mechan professor of public health at the University of Glasgow, Scotland.

DISCUSSION AND CORRESPONDENCE

THE UNITY OF ENGLISH WEIGHTS

THERE is but one pound in the English system of weights, and that is the standard pound of 7,000 grains. Every weight known to the English system is a multiple of one or the other of these fundamental and invariable units. The multiples of the pound and of the grain which are used in trade have been fixed entirely by custom or convenience, and not by the prescriptions of arbitrary law. What has been established by custom may, of course, be abandoned by custom. That is the way with free men.

But Professor Alexander McAdie in his letter published in SCIENCE of August 24th, last, states: "7,000 grains make a pound, a certain kind of a pound; 5,760 make another kind of a pound."

The Troy pound (which is Mr. McAdie's another kind of a pound) was abolished as a legal weight in the United Kingdom eighty years ago, and the Troy pound is likewise entirely obsolete in the United States. There is accordingly only one pound weight in the United States and the United Kingdom.

The Troy ounce of 480 grains is now confined to use in the weighing of gold and silver bullion. Statistics of gold and silver production, for example, are given in millions of ounces. The Troy ounce, moreover, has been legally decimalized, both as to submultiples and multiples in the United Kingdom. The British statute on bullion weights provides for the division of the Troy ounce into tenths, hundredths and thousandths, and the Board of Trade standards include these decimal sub-multiples, and also standards for 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 100, 200, 300, 400 and 500 ounce weights of the Troy or bullion ounce. These decimal sub-multiples and multiples of the Troy ounce are in fact the only Troy weights offered to the trade in England or America. In the Assay Office in New York, gold bullion is weighed in the balance against 500 ounce Troy weights, and the intermediate decimal multiple weights are available when required.

The Troy ounce is obsolete as an apothecary's measure. It is the grain (and there is only one grain in the English system) which is the English unit for medical prescription. The ounce of the apothecaries is not the Troy ounce, but the ounce measure or fluid ounce, which in England is the volume of the standard ounce of water, and in America is the sixteenth part of the pint of the old wine gallon of 231 cubic inches. There is some variation here, the American fluid ounce being the volume of 1.042 ounces of water, whereas the British fluid ounce is the volume of an ounce (one sixteenth of a pound) of water, precisely. We ought to adopt the British fluid ounce in this country. Even now it is customary for apothecaries to regard the fluid ounce as the measure of an ounce of water flat.

Drugs and fine chemicals are fast becoming handled in the trade as "ounce goods," and as such are quoted and sold by the hundred or thousand ounces, the British standard or avoirdupois ounce being indicated, and such drugs, purchased by the avoirdupois ounce, are dispensed on prescription by grains weight, when not sold in solutions measured in fluid ounces. The foregoing is in conformity not only to present practice, but also to the recommendations made by the commissioners for the Restoration of the Standards, in their report to Parliament of December 21, 1841, from which the following paragraphs are quoted:

> 41. That the Troy pound be no longer recognized; that the word pound, or any letters or symbols commonly used to denote the pound, as applied to a weight, be always interpreted to mean the pound of 7,000 grains (formerly called the avoirdupois pound).
>
> 42. That the word ounce be always interpreted to mean 1/16th part of the pound, except it be described as the Troy ounce.
>
> 43. That the use of the Troy ounce and pennyweight be confined to gold, silver and precious stones.
>
> 44. That in contracts applying to any other substance whatever (drugs included) no denomination be recognized lower than the pound except the ounce, the grain and the decimal parts of the pound.

The movement to decimalize the standard ounce, just as the Troy ounce for bullion weights has been

decimalized, ought to be encouraged. Weights of the tenth, hundredth and thousandth part of the standard ounce are now available to the trade, and fine balances with beams graduated to tenths and hundredths of the ounce, are also offered by manufacturers. Package goods for retail trade ought to come in 10, 20, 30, 40, 50 or 100 ounce containers, and liquids should come in containers of the same denominations of fluid ounces, the fluid ounce being newly defined as the volume of the standard ounce of water.

And there is an advantage of far-reaching importance in this project. The inch, equal to 25.4 millimeters, which is the most precise as well as practicable value which can be given the inch, produces 304.8 mm to the foot; or 30.48 mm to the tenth of the foot, the cube of which is 28,316.877072 cubic millimeters, from which it follows that the weight of the cube of the tenth of the root of water is 28,316.877072 milligrams. But the kilogram, while projected as the weight of the liter of water, has been found to be the weight of 1.000,027 liters of water, which means that the liter of water weighs 1,000,000/1,000,027 kilograms, and that the cc of water weighs 1,000,000/1,000,027 grams. Applying the correction, we find that the cube of the tenth of a foot of water weighs 28,316.112536 milligrams. As the standard ounce is 28,350.2 milligrams in weight, the weight of the cube of the tenth of the foot of water is but 34.1 milligrams less than the weight of the standard ounce. The weight of the grain is 64.8 milligrams, so that by reducing the standard ounce 341/648 or .526 of a grain, or from 437.5 grains to 436.974 grains, we can produce a new ounce which is precisely equal to the weight of the cube of the tenth of the foot of water, and of which 1,000 would equal one cubic foot, just as 1,000 grams equal 1 cubic decimeter of water.

Let us, therefore, have a new American standard ounce, precisely equal in weight to the ounce measure of water, defined as the volume of the cube of the tenth of the foot, and then let the standard American ounce be divided into decimal sub-multiples corresponding to the dimes, cents and mills of the dollar, and be used in decimal multiples for retail trade weights. The change from our present weight standards would only be about one per thousand (or more precisely, 1 per 900), which is well within the tolerances allowed for trade weights. The change would accordingly be entirely negligible in trade and contracts, and would give us a scientific precision in weights, and a correlation of weights and volumes that leaves nothing to be desired.

The so-called long ton in America should be abolished by law, as it has already become obsolete by custom in a large part of the country. The long ton is now unknown in the great coal and metalliferous mining trades of the Rocky Mountain region. The all-important ton-mile of the railroads, in universal use the country over, is based on the standard ton of 2,000 pounds.

The Troy pound may be regarded as obsolete, and the long ton as obsolescent, and accordingly as nonexistent in the United States, except in the historical sense.

SAM'L RUSSELL

WASHINGTON, D. C.

PECULIAR HAIL

WHILE engaged in field work for the Illinois Geological Survey in the vicinity of Oregon, Illinois, the writer observed a hail storm that had certain peculiar characteristics. The storm occurred about mid-afternoon on August 7, and was observed in Oregon, which is in Rock River Valley, about 100 miles west of Chicago.

The preliminary meteorological conditions were: (1) A gentle two-hours' rain in the early forenoon, followed by clear skies; (2) increasing cloudiness towards noon with heavy storm clouds formed in the northwest, from which a hard rain passed to the south and another to the north and east; (3) increasing sultriness after noon until it became very oppressive prior to the close approach of the storm, and (4) an apparently heavy rain moving from northwest to the north and east, followed by the formation or splitting off of a smaller storm in the northwest, which spread rapidly west and south as it moved southeastward toward Oregon. In the latter storm heavy, dark clouds were moving swiftly, with considerable "boiling" in the southeast portion. High wind and heavy rain appeared to be approaching rapidly, accompanied by some violent lightning and thunder, but less than is common in a typical thunderstorm.

The storm reached Oregon from the northwest as a sudden squall of wind, quickly followed by large raindrops, with a few hail of uncommon size. Leaves began to be abundantly blown and beaten off the trees. The hail increased rapidly in size and quantity so that the lawns were soon covered as though by a layer of coarse quartz gravel. This continued for about three minutes, with considerable wind and rain, then the storm rather rapidly subsided, until the sun was shining about 15 minutes after the first hail fell. In one district only was the wind violent, as evidenced by overturned trees and shattered windows. Outside of this limited area few windows were broken.

Most of the hail was of a size and form not observed hitherto by the writer in his experience with hail storms in the Mississippi Valley and the northern Rocky Mountains. Hail measured immediately at the close of the storm with dimensions of 2″ x 1″ x ¾″ were plentiful, and a few were 2½″ x 2″ x 1¼″. One stone 2″ x 3″ was reported. Hail about one inch

across was the dominant size, with apparently few less than one half inch in diameter.

Much of the hail was of peculiar form as well as of uncommon size. The smaller stones were spherical to subspherical, and had a frosted appearance. Some were markedly discoidal with a frosted nucleus surrounded by relatively clear ice. This nucleus exhibited clearly in many specimens concentric layers of clear and frosted ice surrounding a more or less frosted core. This type of hail attained a maximum diameter of one inch or slightly more. The larger stones had a different form, characterized by fantastic outlines and unequal diameters. Many had the appearance of a mass of small pieces of hard candy that had stuck firmly together. Others resembled a group of blunt crystals studding a portion of the wall of a geode. Still others consisted of an irregular solid mass with more or less cylindrical, bluntly spinose projections up to one half inch long and one eighth inch thick.

These bizarre large hail appeared to have resulted from several small stones becoming frozen together during their formation and descent, with the interstices perhaps filled with added ice. The rounded outlines of some of the individual stones could be observed, and were brought into relief through melting. The spinose projections on the masses of aggregated stones are inexplicable by the writer, for they showed no trace of a composite nature, but appeared to have formed as distinct homogeneous projections.

ARTHUR BEVAN

DEPARTMENT OF GEOLOGY,
UNIVERSITY OF ILLINOIS

THE NEW YORK STATE FORESTS

IN SCIENCE for November 2, 1923, resolutions passed by the executive board of the American Engineering Council advocating abolishing the constitutional protection of the New York state forests were printed.

The citizens of that state have invariably voted down that proposal in whatever form it has been presented, and recently they did so again by a decisive majority. This is not because any intelligent person is opposed to scientific forestry or the proper use of the power resources of that region. It is because there exists no machinery in the state government to insure the continued application of any system of real forestry to those lands if they are opened up to commercial exploitation, and because the laws and the constitution do not appear to provide any safe and reliable means for establishing any. The forests would be in charge of officials whose term of service would be likely to end after the next election, and if a good administration saved any of the forest, it would only be for the bad one following to make away with.

That until the problem of the continued proper administration of those forests is solved, any breaking down of their present constitutional protection means their destruction is a fact so self-evident as to require no discussion. The resolutions ignore this completely.

People familiar with the Adirondack and Catskill regions will be curious to learn where the "great volume of ripened timber" that is stated to be decaying away is located.

The increasing practice of securing the indorsement of prominent scientific and professional organizations for schemes and proposals without the members having knowledge or understanding of the things they are represented as approving is an evil that can not fail to affect adversely not only the organizations, but the public's respect for scientific opinion.

WILLARD G. VAN NAME

NEW YORK CITY

THE PROFESSOR AND HIS WAGES

WHILE in other circumstances I might hesitate to trespass on your columns to the exclusion of more important matter than controversy, self-defense is an excuse which makes even trespass lawful. It is a pity that Mr. Welsh read my letter with so little attention before he started to answer it, and rebuke me for "theorizing without that judgment and knowledge of 'how much' that only experience in the field dealt with teaches."

Item, he accuses me of overestimating the rewards of the business man in my little table of comparison with the professor: "The profits assumed for the merchant are much beyond the average." Quite so! If Mr. Welsh will reread my letter he will find the words "Admitting that not all merchants are as successful as Mr. Smith . . ." I specifically stated that I was comparing two unusually successful and competent men, one in business, the other in teaching. If Mr. Welsh supposes that the *average* college professor gets $4,000 a year, or that the average teacher ever obtains a professorship in any large institution, he will find little confirmation in the various studies of university, college and secondary school conditions made by the Rockefeller and Carnegie Foundations.

Item, he accuses me of dismissing "quite lightly" the risk of capital in business, a point on which I laid particular stress: "The rewards of the entrepreneur are and should be higher than those of the salaried man because his risks are greater. . . ."

Item, Mr. Welsh justifies the higher incomes of businessmen on the ground that they are a selected class and the "average professor should not be compared with the successful businessman but rather with the latter's employees." Which reminds me strongly of my own statement that "we need not assume that the average instructor or professor is as

able as a captain of finance." The ablest professors in the country would be overjoyed to have a salary equal to that of the higher and more competent business employees, the factory managers, expert salesmen, etc. But by "employees" Mr. Welsh seems to mean "clerks," for in his final sentence he ranks the merit of the average professor below that of the average clerk. That would put the young instructors and the secondary school teachers level with the office boy, and as for the primary teachers would not a German mark be overpayment?

But grant everything Mr. Welsh says. Suppose that the great majority of our faculties are made up of "unselected" weaklings or incompetents who "get all they are worth to the community." The real point remains. Is Mr. Welsh content that such men, cheap men bought for an unskilled laborer's wages, should instruct *his* children? Or is he willing to raise the price and get better men? Or does he consider science and scholarship so unimportant that they can be confidently entrusted to an inferior type of human being?

PRESTON SLOSSON

ANN ARBOR, MICHIGAN

A WARNING TO MICROSCOPE USERS

FROM personal experience the writer wishes to warn both the microscope user and manufacturer of the danger of the projecting corrugated rim of the ordinary microscopical eyepiece as an agent for producing an epithelioma in the region of the orbit. This applies especially to the binocular microscope, where it is almost impossible to look through the microscope without scraping a piece of nasal epithelium with the eyepiece. Can any other procedure, if repeated day after day for year after year, be any more favorable for the production of an epithelioma on the side of the nose?

WM. F. ALLEN

UNIVERSITY OF OREGON MEDICAL SCHOOL

SCIENTIFIC BOOKS

Mankind at the Crossroads. By E. M. EAST. 8vo., viii + 360 pp. New York, Scribners, 1923.

WE have here a book on "Population" by a biologist. It is devoted to the discussion, in a general way, of the quantity and quality aspects of the population problem.

The argument of the book is to the effect that: (1) Certain processes in present-day civilization are dysgenic due to the fact that it is made easy for inferior types to breed more rapidly than superior types; (2) the present rate of increase of the white race will bring it up against food barriers in about fifty years; (3) many parts of the world—particularly those inhabited by the brown and yellow races—are already so filled that but little further increase can take place; (4) the sensible thing for us to do in the light of these facts is to undertake a thoroughgoing control of population growth, both for the purpose of preventing deterioration in the quality of the stock, and in order to keep numbers down to the point where man may have time and energy for something besides extracting a meager living from the soil.

After a short introductory chapter calling attention to the urgency of population problems, Professor East opens his argument proper by exposition of the biological principles which must be kept in mind in any discussion of population. It is interesting to note that he—a genetic specialist—is far less dogmatic on the question of the inheritance of acquired character than most biologists. "Everything is relative," says the author, and with that belief one can not very well be dogmatic on such a matter. "For all practical purposes," however, the possibility of the inheritance of acquired characters can be disregarded.

His statement of the way in which racial traits have probably developed and the likely results of race crossings is of fundamental importance to the social scientist; while the explanation of the significance of the mechanism of heredity is of great interest and importance to everyone. These facts of heredity urge more potently than any emotional appeal, care in selection of mates. And yet one is not made to feel that breeding superior stock is the sole aim of life, as many eugenists seem to think. After showing that we now have sufficient biological knowledge to enable us to maintain our stock at its present level of ability or, even to improve it, the author wonders whether we have the ability to apply this knowledge.

The rest of the book may be looked upon as an effort (very successful in the reviewer's judgment) to prove that we must undertake in a definite manner to control population growth in the light of clearly established biological principles, and in the light of our knowledge regarding the food supply, if we are not come to grief in the near future. A brief review of population opinions held in the past is followed by a statement of the growth of population in the world to-day, and what this means in terms of increased production of food. The author comes to the conclusion that three times the present population of the world will use up all tillable land, and that when there is this population, the standard of living will be about the equivalent of that of the peasants of western Europe. At our present rate of increase, it will take about a century for population to triple. But, Professor East shows that within about fifty years that part of the world open to Europeans will be so filled up, at present rates of increase, that pressure will become keen and the positive checks—famine, disease, war—will become operative. The chapters on

"Population and Food Supply" and "Permanent Agriculture, Population Restriction and National Progress' will give pause to those optimists, who are so, because they ignore facts. Professor East has done notable service in bringing the pertinent facts together in such concise fashion, and in driving them home with all the force of a very clear style. It is true he asks us to take some of his facts on faith, but the tone of his whole discussion rings true, and those of us who have given some attention to the study of the same matters know that his facts are facts, not guesses or surmises.

The chapter on "Racial Prospects and Racial Dangers" effectually disposes of such inaccurate vaporings as those of Lothrop Stoddard in his "Rising Tide of Color." Here, too, he makes concrete application of what genetics has to teach about race mixtures. His discussion of the race problem in the United States is scarcely convincing, but it deserves attention.

The chapter on the "Rôle of Death in the Drama of Life" seems rather superfluous. Such matter as is germane to the general argument could have been discussed under Public Health. The chapters on Birth Restriction and Public Health and The Birth Rate and Social Progress, drive home the truth that only by properly controlled population growth can we hope to make any real progress in social improvement. Without restriction of birth, we will soon be so driven by pressure upon the limited means of subsistence that no forward movement will be possible, and unless this restriction is directed intelligently, the quality of the people is sure to decline. One may feel less certain of the value of the methods now available for picking out the better stock than Professor East does (mental tests in general, and Army tests in particular) and yet agree with his general conclusion regarding the necessity for intelligent selection.

One is also glad to note that he does not assume that modern medicine and charity have entirely eliminated natural selection from the social process as so many biologists, perhaps one should say eugenists, seem to hold. Selection among men has always had an artificial (social) element in it and this element is not greatly changed in intensity to-day from what it was two or three centuries ago.

Other good points are the recognition of the vital rôle of social influences in individual and group development; the realization that there can never be a sound eugenics so long as the rapid breeding of better stocks to replace poor stocks is its sole aim; the emphasis upon the fact that there is much good ability in all classes of the population; the strong faith in the ability of man to control his own destiny; the consequent belief in the efficacy of education; and the conviction that a high type of family life lies at the root of any sound social order.

It is impossible, however, to do justice to the general excellence of this book by trying to give a notion of its contents. It is easily the best book on the practical aspects of our quantity and quality population problems that has appeared in America. It is written in a clear forceful style which proves that science need not be dry as dust to be truthful. It represents the gathering together of an enormous mass of facts, and such a complete assimilation of these facts that the conclusions may seem too little based on evidence to one unfamiliar with this field. A less thorough assimilation and a less skillful presentation would, however, only have wearied the reader with details, without carrying as much conviction.

It is a book no one interested in social problems can ignore.

WARREN S. THOMPSON
MIAMI UNIVERSITY

ORGANIC CHEMICAL TRANSFORMATIONS

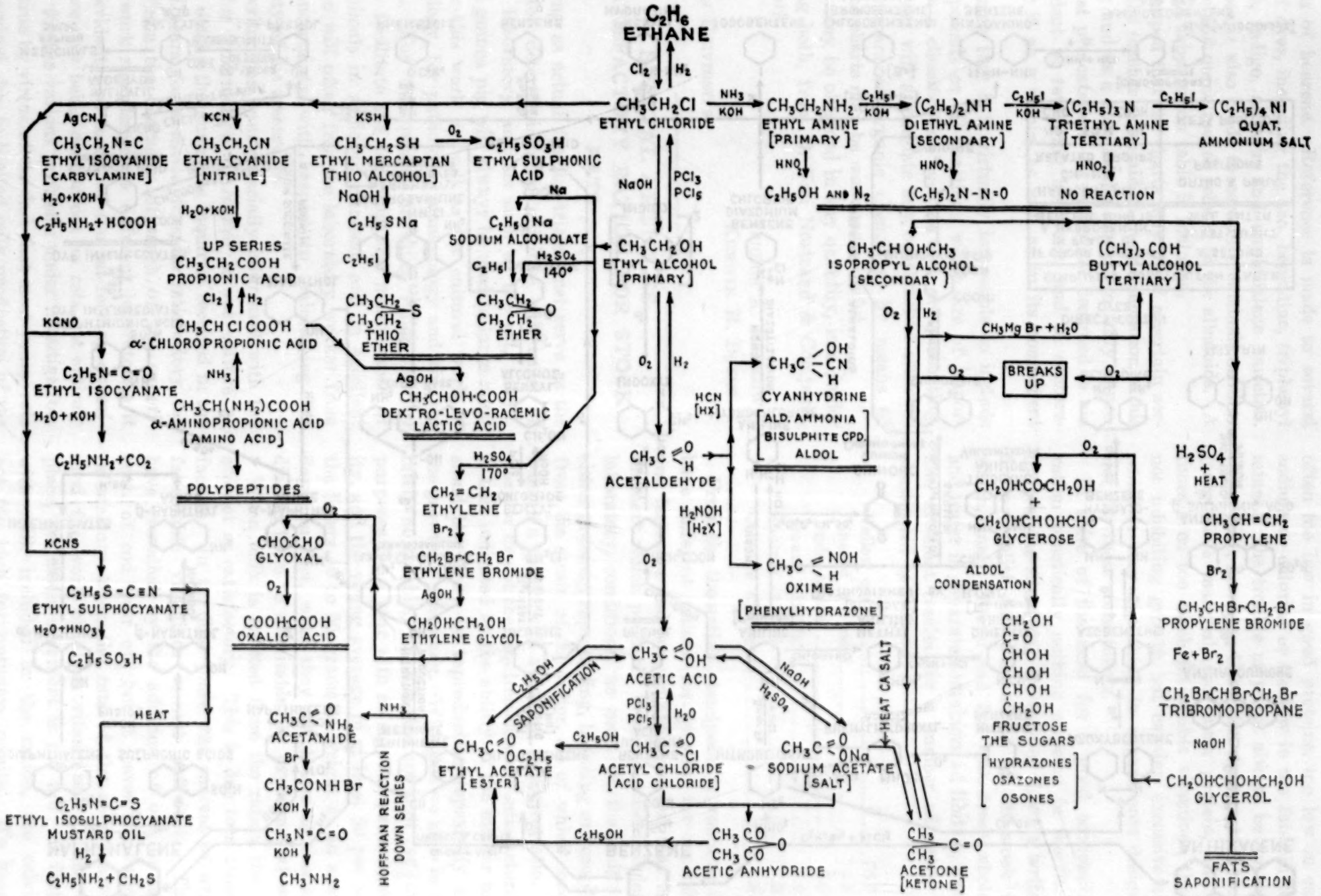
IT is the belief of the writers that the most important thing in the teaching of organic chemistry is to make the student understand the fundamental relations existing between the different classes of organic compounds. To this should be added a knowledge of the typical reactions which these compounds undergo. Only when he has attained this point of view does he begin to see the truly remarkable order which in reality prevails among the mass of material which is presented to him; and only when he appreciates this order will he make good progress in the subject.

As a result, the charts which accompany this introduction were elaborated, with the aim of presenting these fundamental relations and typical reactions in as concrete a form and as small a space as possible.

In the first or aliphatic series chart, the starting point is the basic hydrocarbon ethane, and from this it is possible to pass to every other compound indicated, by following the arrows. The reagent required to effect each change appears upon the arrow showing that change. Ethane was chosen as the starting point because its derivatives are relatively simple. Methane is not suitable, because the reactions of its derivatives present too many exceptions to the general rules holding for those of its higher homologues. The chart includes methods for passing up and down the series, and references to optical activity, amino acids and sugars.

In the aromatic series chart, the basic hydrocarbon is, of course, benzene, supplemented by naphthalene and anthracene. It is possible to pass from benzene to every other compound shown on the chart. In this series the vast number of important derivatives present a real difficulty, which has been obviated in part

ALIPHATIC SERIES



"H_2" SIGNIFIES "REDUCTION"
"O_2" SIGNIFIES "OXIDATION"

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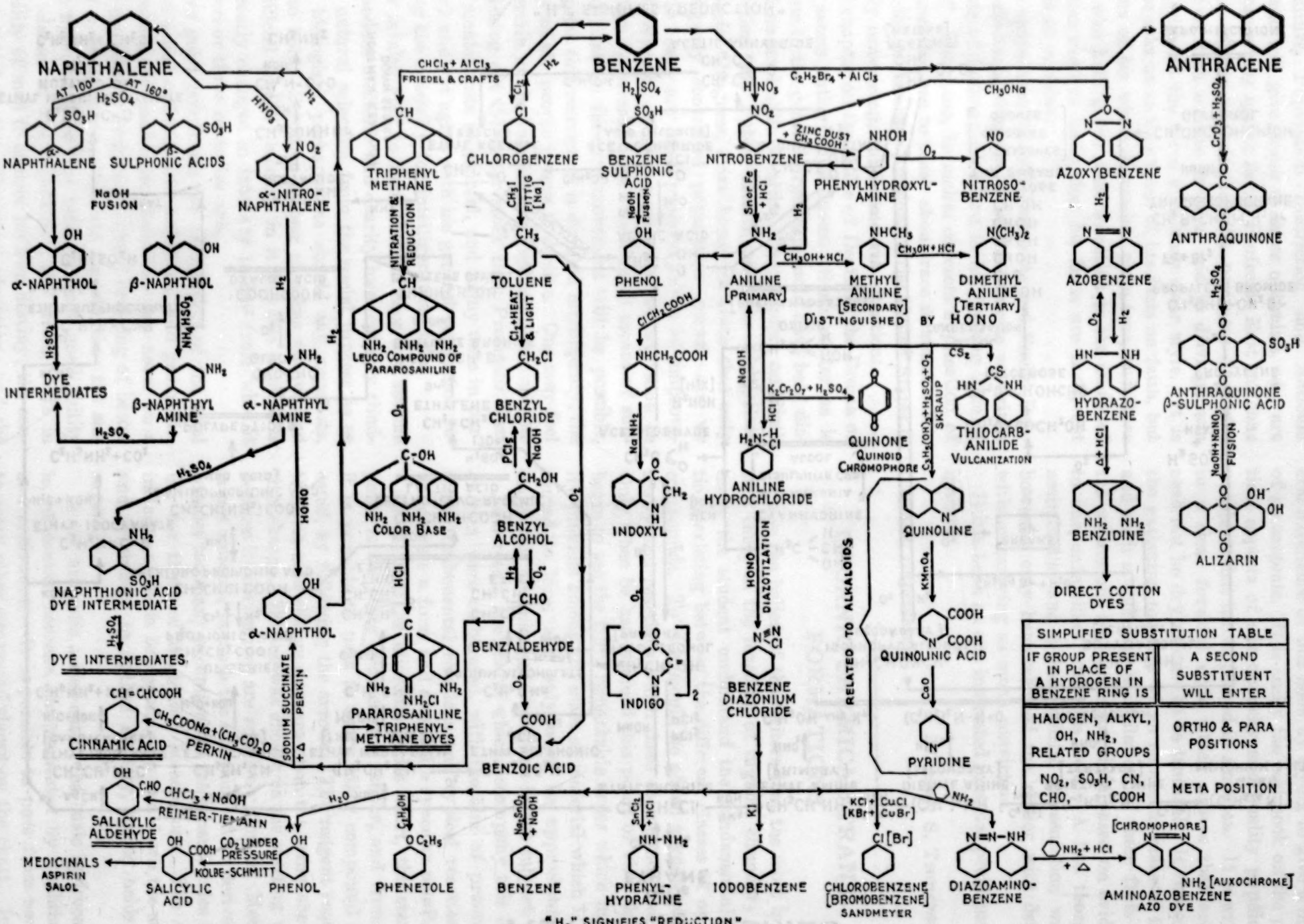
AROMATIC SERIES



SIMPLIFIED SUBSTITUTION TABLE	
IF GROUP PRESENT IN PLACE OF A HYDROGEN IN BENZENE RING IS	A SECOND SUBSTITUENT WILL ENTER
HALOGEN, ALKYL, OH, NH_2, RELATED GROUPS	ORTHO & PARA POSITIONS
NO_2, SO_3H, CN, CHO, COOH	META POSITION

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by presenting, essentially, only the monosubstitution products of benzene. Reference is made to several types of dyes, including the azo, benzidine, triphenyl methane, indigo, alizarin and naphthalene varieties. Reference is also made to certain medicinals, and to pyridine and quinoline, as related to the alkaloids. A simplified substitution table is included.

It is hoped that the charts may be of a certain service to the teacher as an aid to the presentation of his subject; and as a help to the student to fully appreciate that presentation. It is further designed to aid the student in reviewing his work, and in comprehending it as a whole, as well as in its component parts.

Realizing that it is virtually impossible to include all compounds or all reactions which are of importance, in a classification such as they are presenting, the writers will appreciate any constructive criticism from teachers of organic chemistry, by means of which the charts may be made more useful.

These may be obtained in any quantity, in a folder including both, from D. Van Nostrand & Company, New York.

LUCIUS A. BIGELOW
KURWIN R. BOYES

BROWN UNIVERSITY

SPECIAL ARTICLES

A SATISFACTORY RATION FOR STOCK RATS

As long as actual feeding trials must serve as the means for determining the nutritive sufficiency of rations, laboratory animals such as the rat, rabbit, dog and guinea pig will always be used in large numbers for this work as well as for cultural work in bacteriology, for pathology, immunology and kindred sciences. For this reason anything which can be done to facilitate the breeding and maintenance of these animals in sufficient numbers and in excellent condition will often free the laboratory worker from much uncertainty with respect to maintaining the continuity of his researches.

The writer has been especially impressed with the desire for information in regard to rat culture as brought out by the numerous inquiries received in the last five years for a ration formula satisfactory for rats. From the character of much of the experimental work reported from different laboratories it also is evident that many of the rat-feeding experiments are now being carried out on rats not entirely suitable for the various problems under investigation. This is true by virtue of the fact that most young rats are undersized, due to limited milk production of the mother causing them to not only partially starve but also to eat excessively of the mother's ration before their time. The rations on which they are kept are often too low in good proteins, too low in calcium, sodium or chlorine or too low in the fat-soluble vitamines. The trouble may not always be on the deficiency side, however; the ration may contain too much indigestible material, too much protein, and sometimes even too much fat-soluble vitamines, the latter not inhibiting growth but causing excessive storage which is very disturbing in experiments designed to test for these constituents.

In spite of the need for a good economical rat ration practically nothing appears in the literature to meet the situation. In view of this the writer sees fit to publish the composition of his stock ration, which, finely ground and fed with fresh whole milk and water in separate containers ad libitum, has given him excellent results for a number of years. It is constituted as follows:

Yellow corn	76.0
Linseed oil meal	16.0
Crude casein	5.0
Ground alfalfa	2.0
Sodium chloride	.5
Calcium carbonate	.5

From the theoretical standpoint it would be best to have different rations for growth, for reproduction and lactation and for maintenance, but that is a refinement which probably is not practical under most laboratory conditions, as most of the animals are either growing, reproducing, lactating or recuperating from the strain of the latter, all of which conditions require a ration with a narrow nutritive ratio. As to whether or not the requirements are satisfactorily met is best indicated by the ability of the mother to withstand the strain of reproduction repeatedly and by the growth of the young. With this we have had absolutely no trouble. The females are kept for breeding purposes for a year with no signs of premature senility, and the young average in at least 90 per cent. of the litters 40 to 55 grams in weight at an age of 23 days; in fact, when they weigh less at this age we discard them as unsuitable for experimental work.

When milk is omitted from the ration the results are not as satisfactory. This is due to a number of factors. In the first place, the content of available fat-soluble vitamines is not sufficient. This we have remedied by the addition of one to two per cent. of cod liver oil, but it leaves the ration less satisfactory when the rats of the colony are to be used for work on these vitamines. In the second place, the calcium content is too low; in fact, even with milk included in the ration, the calcium is not too high for optimum results. We have purposely kept the calcium added as carbonate low because it is apparently not the best salt to use in

large amounts, probably due to neutralization of gastric contents; we have, however, obtained very good results with one per cent. of precipitated calcium phosphate or 1.5 per cent. of bone ash, but our experience with these, in view of the good results obtained with the ration as outlined, are not sufficiently extensive to warrant the change when milk is fed. In the third place, the protein content could probably be advantageously increased.

As milk is available in sufficient quantities at all times in the writer's laboratory, no extensive or prolonged experience with a milk-free ration comparable in efficiency to a milk-containing ration can be drawn upon. When available, fresh whole milk produced by cows on a non-varying ration should be used as a constant ingredient of the stock colony ration, as it serves to cover most effiicently not only known requirements, but no doubt many requirements not as yet appreciated. The factor of proper nutritive condition of the young rats before being started on their various dietary regimens is a factor which enters into the results of all experiments and therefore is worthy of far greater attention than it is given in most laboratories.

H. STEENBOCK
LABORATORY OF AGRICULTURAL CHEMISTRY,
UNIVERSITY OF WISCONSIN

ALKALOIDAL CONTENT OF DATURAS AFFECTED BY MOSAIC INJURY

PLANTS of *Datura Stramonium* grown in the drug garden maintained by the Department of Pharmacognosy of Western Reserve University during the season of 1922 were severely injured by mosaic. The injury affected both green-stemmed and purple-stemmed plants, both being, apparently, equally susceptible. The symptoms of the disease appeared during the height of the growing season, being manifested in the developing leaves, which remained small, and became mottled and distorted. The width of the affected leaves was much reduced, while the tips and the extremities of the dentations were more nearly of normal length, giving the leaves the characteristic stringy appearance not uncommon in mosaic troubles. The plants as a whole were below normal in development.

As the drug value of these Daturas, both of which are official as "Stramonium" in the United States Pharmacopoeia, is believed to depend on their alkaloidal content, alkaloidal analyses were made of both diseased leaves and leaves from plants which showed no mosaic. Leaves taken for analyses were hand-picked from closely adjoining plants at the same time. The petioles were removed. The leaves were dried simultaneously, as rapidly as possible, on the same shelf of a hot-air oven at a temperature not over 100°. Analyses were made by the official method of the United States Pharmacopoeia IX. The results are tabulated below.

TABLE I

				Per cent. alkaloids	Average
Purple-stemmed plants,	mosaic,	Sample	1...	0.27	
"	"	"	2...	0.28	0.275
"	normal	"	1...	0.147	
"	"	"	2...	0.138	0.142
Green-stemmed plants,	mosaic,	Sample	1...	0.27	
"	"	"	2...	0.303	0.285
"	normal	"	1...	0.072	
"	"	"	2...	0.072	0.072

It will be noted that the figures for mosaic plants of both varieties are slightly above the official alkaloidal requirements (0.25 per cent.) for Stramonium as a drug, and, by themselves, are therefore by no means remarkable. The notably low results of the normal leaves may be considered as rather unusual, especially in the case of the green-stemmed plants, inasmuch as both varieties appear rarely to fall below the pharmacopoeial requirement. The locality of growth was considerably shaded. Schneider[1] has observed that plants of the closely related *Atropa belladonna* show a markedly higher alkaloidal yield when grown in full sun. Inasmuch as the Daturas are normally sun-loving plants, it appears not improbable that the factor of insolation may have been involved. As the mosaic plants were subjected to the same conditions, this factor can not be held responsible for the marked disparity in content between normal and mosaic leaves. Sievers[2] has shown a marked increase of alkaloidal content following prevention of flowering in the Daturas; while flowering was by no means inhibited in these mosaic plants, it was apparently hindered to some extent by the distortion of the flowering-tops. In Sievers's experiments, however, inhibition of flowering increased the size of leaves—the converse of the effect of mosaic. The same author[3] has also shown an increased concentration of the alkaloidal content of belladonna in the tender growing parts, which, in the Daturas, are most affected by mosaic. It is evident, of course, that a given weight of mosaic material represents a considerably greater number of leaves than the same weight of normal leaves.

[1] Schneider, Albert, "The cultivation of belladonna in California," Bulletin 275, Agricultural Experiment Station, Berkeley, Cal., 1916.

[2] Sievers, A. F., "The influence of inhibiting flowering on the formation of alkaloids in the Daturas," *Jour.* of the American Pharmaceutical Association, Vol. X, No. 9, pp. 674–676, 1921.

[3] Sievers, A. F., "The distribution of alkaloids in the belladonna plant," *Am. Journ. Pharm.*, Vol. 86, No. 3, p. 97, 1914.

It is planned to continue the observation of the symptoms and effects of mosaics on the Daturas, with special reference to alkaloidal yield. Inasmuch as a somewhat similar disease has been noted here on *Hyoscyamus niger,* this species also will be subjected to similar investigations if the disease reappears.

E. E. STANFORD
E. D. DAVY
WESTERN RESERVE UNIVERSITY

THE OPTICAL SOCIETY OF AMERICA

THE eighth annual meeting of the Optical Society of America, Dr. L. T. Troland, president, was held at Cleveland, Ohio, Thursday, Friday and Saturday, October 25–27, 1923. Hotel headquarters were at the Hotel Cleveland. All sessions for the reading of papers were held in the Physics Building, Case School of Applied Science.

The meeting was held under the auspices of the following local committee in Cleveland:

Representing the National Lamp Works: Dr. W. E. Forsythe, *chairman;* Mr. L. C. Kent, Mr. C. D. Spencer, Mr. M. Luckiesh, Mr. A. H. Taylor, Dr. A. G. Worthing.

Representing Case School of Applied Science: Professor D. C. Miller.

Representing Western Reserve University: Professor H. W. Mountcastle.

Representing Warner and Swasey: Mr. Warner Seely.

In concluding its sessions the society tendered a most hearty vote of thanks to this committee as well as to the National Lamp Works, Case School of Applied Science, Western Reserve University, Warner and Swasey and the Cleveland Museum of Art for their efforts which resulted in a meeting generally admitted to be the most notable and successful in the history of the society.

About 50 persons attending the convention registered and obtained rooms at the Hotel Cleveland. The *registered* attendance at Case School was 78, of which 57 were from outside of Cleveland. The *actual* attendance was undoubtedly much greater than this. The number present at the sessions varied from about 50 to over 250.

SPECIAL FEATURES OF THE MEETING

The address of the retiring president, Dr. L. T. Troland, October 26, was on "The optics of the nervous system."

Other notable features of the meeting deserve special mention.

(1) Professor A. A. Michelson's paper on "The limit of accuracy in optical measurement" contributed by invitation on October 26: In introducing Professor Michelson, Professor D. C. Miller of Case School recalled in a very happy manner Professor Michelson's early connection with the department of physics at Case, mentioning his work on the velocity of light, the interferometer and the renowned experiment on "ether drift." He also exhibited as mementos of this early work parts of Professor Michelson's original apparatus. Before proceeding with his paper, Professor Michelson also recounted a number of interesting reminiscences of his first measurements of the velocity of light and the development of the interferometer. Over 250 persons heard Professor Michelson speak.

(2) Papers contributed by invitation by Professor E. L. Nichols as follows on October 26: "The spectral structure of the kathodoluminescence of metals in solid solution," by T. Tanaka; "On the spectra of incandescent oxides," by E. L. Nichols and L. J. Boardman.

(3) Visits to the Cleveland Museum of Art: The Cleveland Museum of Art is located in Wade Park only a short distance from Case School. On October 25, the director of the museum, Mr. Frederic Allen Whiting, addressed the meeting by invitation, and explained the work of the museum in a most interesting manner, dwelling particularly on "The optical problems of an art museum." He extended to all members and guests of the society a most cordial invitation to visit the museum. Many availed themselves of this opportunity to visit a museum which is notable and exceptional in many respects, and these visits contributed greatly to the pleasure and profit of attendance at the meeting.

(4) Visit to Nela Park: On the afternoon and evening of October 25th, members of the society were guests of the National Lamp Works at Nela Park. Parties were conducted through the Research Laboratories, the Laboratory of Applied Science and lamp factories and were given exceptional opportunities to observe the actual manufacture of lamp bulbs and lamps. In the evening a complimentary dinner given to the society by the National Lamp Works was followed by a symposium on light and lighting by Professor E. F. Nichols, Mr. Ward Harrison and Mr. M. Luckiesh and a beautiful experimental demonstration of the projection of mobile color patterns by Messrs. M. Luckiesh and A. H. Taylor, of the Nela Laboratory of Applied Science.

(5) Visit to Warner and Swasey: On October 27, the society visited the plant of Warner and Swasey, which is renowned for the construction of the largest astronomical telescope mountings in the world. Members were personally greeted by Mr. Swasey, who showed many objects of interest in his office. The mounting for the giant reflector which is just being completed for the Ohio Wesleyan University was on